

We claim:

Sub B1

1. A method for preparing a non-human animal for screening for agents that modulate tolerance to an immunogen comprising the steps of
preparing a nucleic acid directing expression of said immunogen, and
exogenously delivering said nucleic acid to the liver of said animal, under conditions that result in the sustained expression of the immunogen in the liver.

2. The method of claim 1 wherein the nucleic acid is packaged in an adeno-associated virus particle.

Sub B2

3. A method for preparing a non-human animal for screening for agents that modulate tolerance to an immunogen comprising delivering said immunogen to the liver of said animal under conditions that result in sustained presence of said immunogen, and wherein said delivery is not by expression of a nucleic acid present in the germline of said animal.

4. The method of claim 1, wherein the immunogen is a HCV immunogen.

5. The method of claim 3, wherein the immunogen is a HCV immunogen.

6. The method of claim 1, wherein the animal is a rodent.

7. The method of claim 3, wherein the animal is a rodent.

8. The method of claim 1, wherein the delivery is by portal vein injection.

9. The method of claim 3, wherein the delivery is by portal vein injection.

10. The method of claim 1, wherein the immunogen is the NS5a protein of HCV.

11. The method of claim 3, wherein the immunogen is the NS5a protein of HCV.

12. A non-human animal for screening for agents that modulate tolerance to an immunogen prepared by the method of claim 1, wherein said animal is tolerant to said immunogen.

13. A non-human animal for screening for agents that modulate tolerance to an immunogen prepared by the method of claim 3, wherein said animal is tolerant to said immunogen.

14. The method of claim 12, wherein said screening is for agents that modulate tolerance to a viral immunogen, and said animal is tolerant to said viral immunogen.

15. The method of claim 13, wherein said screening is for agents that modulate tolerance to a viral immunogen, and said animal is tolerant to said viral immunogen.

16. A non-human animal for screening for agents that modulate tolerance to a HCV immunogen, said animal prepared by the method of claim 4, wherein said animal is tolerant to said HCV immunogen.

17. A non-human animal for screening for agents that modulate tolerance to a HCV immunogen, said animal prepared by the method of claim 5, wherein said animal is tolerant to said HCV immunogen.

18. The non-human animal of claim 16, wherein the animal is a rodent.

19. The non-human animal of claim 17, wherein the animal is a rodent.

20. The non-human animal of claim 16, wherein the HCV immunogen is the NS5a protein of HCV.

21. The non-human animal of claim 17, wherein the HCV immunogen is the NS5a protein of HCV.

22. A method to screen for tolerance modulators for an immunogen comprising

administering a test agent to a non-human animal that is tolerant to said immunogen, wherein said administration of said test agent occurs during or after delivery of said immunogen, and detecting a modulation in the state of tolerance to said immunogen as compared with controls.

23. A method to screen for tolerance modulators for an immunogen comprising administering a test agent to a non-human animal that develops tolerance to said immunogen, wherein said administration of said test agent occurs before delivery of said immunogen, and detecting a modulation in the state of tolerance to said immunogen as compared with controls.

24. The method of claim 22, wherein the immunogen is a HCV immunogen.

25. The method of claim 23, wherein the immunogen is a HCV immunogen.

26. A method of treating a disease associated with tolerance to an immunogen comprising administering to a patient an effective amount of an agent identified by the method of claim 22.

27. A method of treating a disease associated with tolerance to an immunogen comprising administering to a patient an effective amount of an agent identified by the method of claim 23.

28. A method of treating a disease associated with tolerance to an immunogen comprising administering to a patient an effective amount of an agent capable of modulating immunological tolerance to said immunogen.

29. The method of claim 28, wherein the disease is HCV.

30. The method of claim 28, wherein the disease is chronic HCV.

31. The method of claim 28, wherein the disease is chronic.

32. The method of claim 28, wherein the agent is an antibody having specificity for a molecule selected from the group consisting of: CD40, CD80, CD86, and Fas.

33. The method of claim 28, wherein the agent is a cell selected from the group consisting of: dendritic cells and macrophages.

34. The method of claim 28, wherein the agent is a factor selected from the group consisting of: IL-2, IL-6, IL-10, IL-12, TGF β , and Flt-3 ligand.

35. The method of claim 28, wherein the agent is cyclosporin A.

36. The method of claim 28, wherein the agent is a Cox-2 inhibitor.

37. A method of modulating tolerance associated with a disease comprising administering to a patient an effective amount of an agent that modulates tolerance in a non-human animal model of tolerance to a disease-related immunogen.

38. The method of claim 37 wherein the disease is selected from the group consisting of microbial infection, parasitic infection, viral infection, and cancer.

39. The method of claim 38 wherein the disease is HCV.

40. A composition for treating a disease associated with tolerance to an immunogen, comprising an agent capable of modulating tolerance to said immunogen in a non-human animal and, optionally, a pharmaceutically acceptable carrier.

41. A method for preparing a non-human animal for screening for agents that modulate tolerance to an immunogen comprising delivering a nucleic acid directing expression of said immunogen to the liver of said animal, under conditions that result in the sustained expression of the immunogen in the liver, provided that said nucleic acid is not present in the germline of said animal.

42. A method to screen for tolerance modulators comprising
administering a test agent to a chronically HCV-infected non-human animal, and
detecting a modulation in the state of tolerance to HCV infection in said animal as compared
with controls.

PP1681.002 PATENT